IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Suekane et al.		
Title:	Magnetic Recording Medium		
Serial No.:	09/895,679	Filing Date:	June 29, 2001
Examiner:	Unknown	Art Unit:	1773
Docket No.:	AK2-C1		

Assistant Commissioner for Patents
Washington, D.C. 20231

DECLARATION OF DR. CHRISTOPHER H. BAJOREK

I, Christopher H. Bajorek, declare:

1. I am Executive Vice President, Advanced Technology of Komag, Inc., the assignee of the above-mentioned application. I have been a vice president of Komag in a technical capacity since 1996. Prior to that, I was Vice President, Technology Development and Manufacturing at IBM. Both at Komag and IBM, I am and was responsible for research and development relating to magnetic disks.

2. I earned B.S., M.S. and Ph.D. degrees from the California Institute of Technology in electrical engineering in 1965, 1967 and 1972, respectively.

3. My curriculum vitae is attached hereto as Exhibit A-1. A list of my publications and patents issued to me is attached hereto as Exhibit A-2.

4. Because of my extensive work in the field of magnetic disks, I consider myself to be an expert in the field of magnetic disks.

5. I have read and understand U.S. Patent Application Serial No. 09/895,679 (the "Application"). I have also read and understand the Amendment and Information Disclosure Statement being filed herewith ("Amendment").

6. The Amendment amends claim 1 to recite that "said magnetic layers are antiferromagnetically coupled to one another across said interlayer." (Claim 1 also states that the interlayer is made of ruthenium.) The Application describes a structure comprising a first magnetic layer, a thin ruthenium interlayer, and a second magnetic layer. See, for example, the description of Example 2, pages 9-11 and Fig. 3. It is an inherent characteristic of such a structure that for thin ruthenium interlayers (e.g. between 3 and 10 angstroms) the first and second magnetic layers are antiferromagnetically coupled to one another. In other words, there is a force that exists (due to the ruthenium) that acts on the lower magnetic layer, tending to cause the lower magnetic layer to magnetize in a direction that is opposite to the magnetization direction of the upper magnetic layer.

7. Komag has done a considerable amount of research concerning this phenomenon. Attached hereto as Exhibit B is a hysteresis curve 1 showing the behavior of a magnetic medium 2 comprising a first cobalt alloy layer 3, a thin (8 angstrom thick) Ru film 4, and a second cobalt alloy layer 5 (see Exhibit C). Attached as Exhibit D is a hysteresis loop of a conventional magnetic medium 10 comprising a cobalt alloy layer 11 (Exhibit E). For Exhibits B and D, the X axis is the H field applied to the magnetic medium, and the Y axis is the B field. (Exhibits C and E do not show the underlayer and protective overcoats present in magnetic media for sake of clarity.)

8. As can be seen, in Exhibit B, when writing to the medium of Exhibit B, one applies a magnetic write field, e.g. to a point P1. This magnetizes a portion of layers 3 and 5 in a direction D1 (Exhibit B). Thereafter, one reduces the applied magnetic write field to zero. As one reduces the magnetic write field, one encounters a point P2 at which

the magnetization direction of lower magnetic cobalt alloy layer 3 switches from direction D1 to direction D2. This phenomenon occurs because there is antiferromagnetic coupling between layers 3 and 5. In other words, the antiferromagnetic coupling exerts a magnetic force that tends to cause the magnetization direction of layer 3 to switch to a direction that is the opposite of the magnetization direction of layer 5.

9. One can construct a magnetic disk having a coercivity and other parameters selected such that the antiferromagnetic coupling is not strong enough to overcome the coercive force of layer 3, and layer 3 does not actually switch direction due to the antiferromagnetic coupling. However, if the ruthenium intermediate layer is sufficiently thin, this antiferromagnetic force, or coupling, always exists.

10. Our data show that antiferromagnetic coupling for ruthenium interlayers having a thickness between 0.3 and 1.0 nm (3 to 10 angstroms) always occurs. It is inherent for a medium having the construction of Exhibit C.

11. Claims 17, 23, 24, and 26 state that the interlayer increases thermal stability of the magnetic film or that antiferromagnetic coupling (which exists by virtue of the interlayer) increases the thermal stability of the magnetic recording medium. This is an inherent characteristic of the medium of Exhibit C. This can be determined because a) data that Komag has collected indicate that this is so; and b) an understanding of the physics of the medium indicates that it must be so.

12. Exhibit F shows data collected by Komag showing the thermal stability of a magnetic medium having the structure of Exhibits C and E. Curve 20 shows the magnetization of a region of the medium of Exhibit C over time, while curve 21 shows the magnetization of a region of the medium of Exhibit E over time. As can be seen, the

medium of Exhibit C has a greater tendency to keep its magnetization state than Exhibit E.

13. The reason for this phenomenon is that thermal stability is a function of $e^{(KuV/kT)}$, where Ku is the magnetic anisotropic constant of the medium, V is the volume of a magnetized region, k is Boltzman's constant, and T is temperature.

14. For a medium of Exhibit C having a magnetized region 30, the effective volume of that magnetized region is greater than the effective volume of a similar region 31 of Exhibit E. Therefore, the medium of Exhibit C has greater thermal stability.

15. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Respectfully submitted,

Christopher H. Bajorek

April 10, 2002

Date

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on 4/11/02.

4/11/02

Date

Signature